



Unexplained Death Investigations

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Overview

- Describe the Unexplained Death Investigations Program
- Discuss the relationship between unexplained deaths and vector-borne and zoonotic disease
- Describe unexplained death investigations and lessons learned

Background

- Unexplained deaths with a history of fever (UNEX) have been reportable to the local health department within 24 hrs since 2004
 - A.A.C R9-6-377 and R9-6-202
- Initiated based on utility in identifying outbreaks in other states

Purpose

- Identify deaths of infectious disease nature that might be:
 - An agent of public health significance
 - A new/emerging infection
 - An act of terrorism
- Separate from ME investigation and autopsy
 - PH does not determine cause of death

UNEX Case Definition

(patient must meet at least one of the following criteria)

- Hospital/facility-based death, no known cause **AND** history of fever ($>100.4^{\circ}\text{F}$) **OR** temp. $<96.8^{\circ}\text{F}$ within 48hrs of death
- Patient-reported history of fever within 48 hrs of death
- Clinical suspicion of infectious etiology by health care provider/medical examiner
- Unattended death, no obvious cause of death

Categorization by Level of Suspicion and Investigation

- **HIGH:** *Investigate within 1 day*
 - illness→death <1week
 - >1 person dying with similar presentation in 2 wks before death
 - evidence cause of death is of public health significance
 - <50 yrs old, no known medical problems prior to illness onset
- **INTERMEDIATE:** *Investigate within 1 week*
 - <50 yrs old, 1 medical problem
- **LOW:** *Investigate within 2 weeks*
 - >1 medical problem
 - significant prior debilitation
 - <6 months old OR >65 yrs old
 - 50-65 yrs old, 1 medical problem

UNEX Investigation Protocol

■ Key Players:

- ADHS, County Health Department (CHD), MEO, ASL

■ Key Steps:

– Hospital

- Obtain medical records for review
- Obtain any specimens available (forward to ASL)
 - Preferably pre-antibiotic specimens
- Obtain any lab results

– Autopsy

- ME role vs. public health role

UNEX Investigations

■ Public Health Activities:

- Differential Diagnosis
 - Created through ADHS consultation with MEO and County Health Department
- Support selected lab testing
- Recommend/implement control measures (if applicable)
- Written case report/summaries are completed by ADHS for all reported UNEX cases

Summary of UNEX Investigations

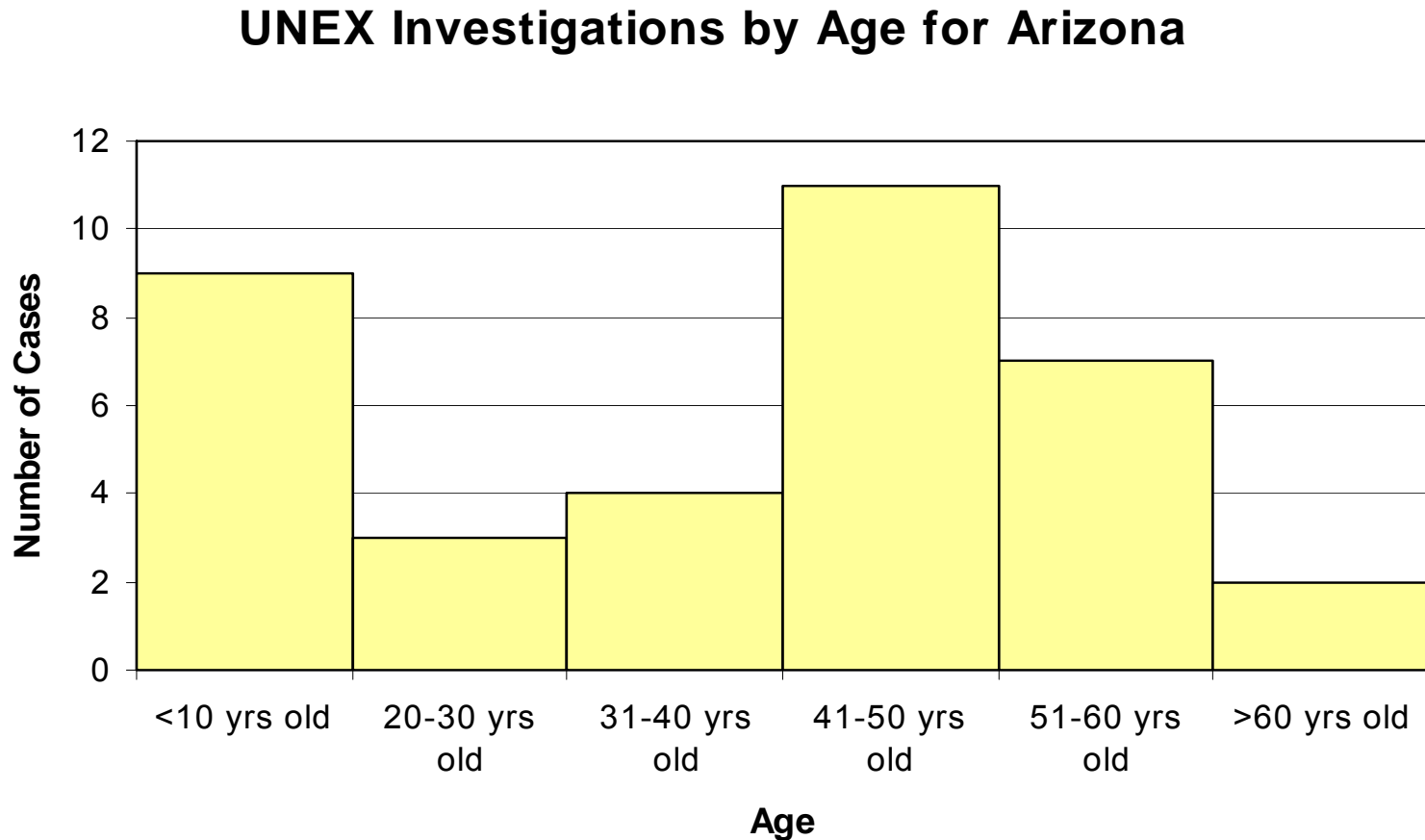
- From 2006 – 2008 (year to date)
 - ~25 deaths are reported each year
 - Autopsies performed on ~ 80% of reported deaths
 - Specimens collected on ~ 30% of reported deaths

	2006	2007*	2008 YTD
Number of UNEX deaths reported	27	23	10
Number of deaths of PH significance	5	4	0

* 2007 data is incomplete

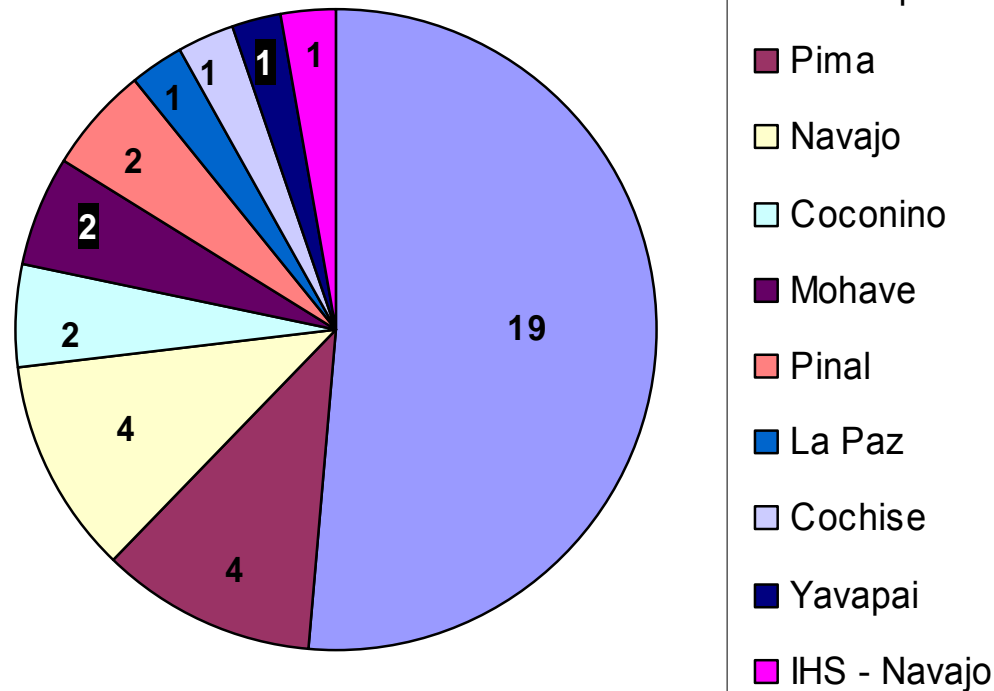
Data for 2007 and 2008 are provisional and subject to change

UNEX by Age: 2006 - 2008, Arizona



UNEX by Geographic Location: 2006 - 2008, Arizona

Unexplained Death Investigations by County in Arizona



UNEX by Location of Death: 2006 – 2008, Arizona

Death Location:

- Hospital: 65% (24)
- Residence: 19% (7)
- Other: 16% (6)

UNEX Investigation Explanations: 2006 -2008

UNEX EXPLANATIONS

Meningitis – probable *Streptococcus pneumoniae* as etiological agent

Encephalitis with unknown etiology

Invasive *Klebsiella* sepsis

Staphylococcus aureus bacterial complication to Influenza B infection

Group A *Streptococcus* infection/pneumonia/sepsis

Neisseria meningitidis

Rocky Mountain Spotted Fever

Hantavirus

Group A Streptococcus
sepsis/pneumonia/bacteremia/necrotizing
fasciitis

MRSA

Plague

Viral, lymphocytic myocarditis

Influenza and/or *Pseudomonas*

Bacterial meningitis

Drug overdose

Coccidioidomycosis

Sepsis

SIDS

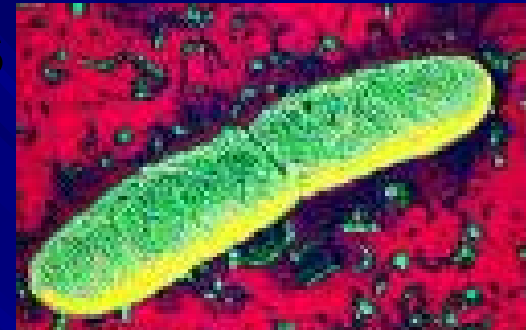
Undetermined cause (all lab analysis at ASL and CDC – negative)

Vectorborne Involvement

Differential Diagnosis



www.msnbc.msn.com



http://webs.wichita.edu/mschneegurt/biol103/lecture14/pestis_big.jpg

Case Presentation

Vectorborne Differential Diagnosis by Category

Respiratory

- ☐ Hantavirus
- ☐ Plague
- ☐ Anthrax
- ☐ RMSF

Sepsis

- ☐ Plague
- ☐ Anthrax
- ☐ RMSF

ENCEPHALITIS

- ☐ Arboviruses (Ex: WNV)
- ☐ Rabies
- ☐ Rickettsial (Ex: RMSF, Q Fever)

UNEX Investigation Explanations: 2008

- 3 UNEX Investigations involved collaboration with the vectorborne and zoonotic section at ADHS for a differential diagnosis
- Vectorborne & zoonotic infectious diseases on the differential diagnosis:
 - Hantavirus
 - *Yersinia pestis* (Plague)
 - West Nile Virus
 - St. Louis Encephalitis
 - Baylisascaris
 - Rickettsial Panel
 - Spotted Fever Group
 - Q Fever
 - Murine Typhus

Vectorborne Involvement UNEX Investigation Example 2006

Background:

- 48 y/o male who died at a border detention center
 - Rumors of plague among first responders
 - Reported to national partners (FBI, Homeland Security & CDC)
- MEO preliminary report: gross examination doesn't indicate plague

ADHS Recommendations for those exposed to this case: (in light of the plague rumors)

- No quarantine, antibiotics, or work restrictions
- Fever surveillance for 10 days from exposure
- If a person gets a fever or otherwise feels ill, the person should see his/her physician

Vectorborne Involvement UNEX Investigation Example 2006 (continued)

Differential Diagnosis:

- Hantavirus – rule out
- *Yersinia pestis* (Plague) – rule out
- Tularemia – rule out
- Rocky Mountain Spotted Fever – rule out
- Bacteremia/Sepsis
- TB – rule out

Lab Results/Explanation: (from both pre-and post-mortem specimens)

- Group A *Streptococcus*
- Few gram (-) rods: *Klebsiella oxytoca*, *Aeromonas* and *Acinetobacter*

Vectorborne Involvement

Example of Differential Diagnosis (2008)

Case Presentation:

- 39 y/o male with severe back pain, body aches, sore throat, and cough
 - Temp: 100.6°F
 - No antibiotics administered
 - Blood cultures negative after 5 days
 - Patient volunteered at a pet rescue center
- Preliminary Autopsy Report: necrotizing hemorrhagic pneumonia

Differential Diagnosis:

- | | |
|-----------------------------------|--------------------------------|
| ■ <i>Pseudomonas</i> | ■ <i>Klebsiella pneumoniae</i> |
| ■ <i>Yersinia pestis</i> (Plague) | ■ <i>Legionella</i> |
| ■ <i>Staphylococcus aureus</i> | ■ Group A <i>Streptococcus</i> |
| ■ Hantavirus (rule-out) | |
| ■ <i>E. coli</i> | |

Explanation:

- MRSA and/or *Klebsiella pneumoniae*

Summary

- Unexplained deaths with a history of fever are reportable in Arizona
- Investigations are very involved and frequently include vector-borne and zoonotic diseases
- Most reports do not involve diseases of public health significance

Lessons Learned

- Engaging public health early
 - Early implementation of control measures
 - Rumor control
- Communication and collaboration
 - Outreach with Medical Examiners
 - Establishing differential diagnoses across programs
- Need for disease specific protocols for some of the more common/complex diseases

Questions?

- To Report an Unexplained Death
 - Contact your local health department
- For Additional Information
 - Contact Claire Ogden – UNEX Epidemiologist
 - (602) 364-3676
 - ogdenc@azdhs.gov